

Long-Term Outcome After Pneumonectomy for Nonsmall Cell Lung Cancer

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Long-term survivors (5 or more years) of pneumonectomy for nonsmall cell lung cancer are at risk for late death from cancer recurrence, second primary malignancies, and cardiopulmonary insufficiency related to the adverse physiological effects of pneumonectomy. A retrospective study of pneumonectomy patients was done to quantify the risks of late death from these causes. Of 246 patients treated for nonsmall cell lung cancer by pneumonectomy, medical records of 49 who survived 5 or more years were reviewed. Follow-up for the 49 long-term survivors ranged from 60 to 240 months, with a mean of 113 months. Twenty-five (51%) of the long-term survivors were alive at the time of the study. Twenty-four (49%) had died. Causes of death included late lung cancer recurrence (6 patients), second primary malignancies (7 patients), cardiopulmonary insufficiency (4 patients), and miscellaneous causes unrelated to cancer and its treatment (7 patients). Long-term survival after pneumonectomy for nonsmall cell lung cancer occurs in 20% of patients. Late lung cancer recurrence and second primary malignancies are important causes of death in these patients. Late cardiopulmonary insufficiency related to adverse physiological consequences of pneumonectomy is uncommon. Long-term follow-up is recommended after pneumonectomy for nonsmall cell lung cancer.

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KEY WORDS: lung cancer, recurrence; second primary malignancy; pneumonectomy, adverse effects; cancer follow-up; pulmonary insufficiency; congestive heart failure

INTRODUCTION

Approximately 25% of patients treated surgically for nonsmall cell lung cancer survive 5 years [1,2]. These long-term survivors are at risk for death from several causes related to cancer and its treatment. Long-term survivors may succumb to late cancer recurrence, second primary cancers, and cardiopulmonary dysfunction that is, in part, a consequence of pulmonary resection. Pneumonectomy, as compared to lobectomy, has the greatest potential for long-term cardiopulmonary dysfunction. Several studies of long-term survival after pulmonary resection for lung cancer have shown reduced crude survival after pneumonectomy as compared to lobectomy [1]. Although this survival difference is partially explainable by oncological factors, premature death from adverse long-term cardiopulmonary effects of pneumonectomy remains a possibility. A retrospective study of long-term

survivors of pneumonectomy for nonsmall cell lung cancer was done to quantify the risk of death from late cancer recurrence, second primary cancers, and cardiopulmonary dysfunction related to pneumonectomy.

MATERIALS AND METHODS

A retrospective study was conducted of all nonsmall cell lung cancer patients treated by pneumonectomy at Roswell Park Cancer Institute between 1964 and 1989. Patients were deemed to be long-term survivors if they survived 5 or more years after pneumonectomy. The Ros-

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TABLE I. Long-Term Outcome in 49 Patients Surviving 5 or More Years After Pneumonectomy

Alive	25
Dead	24
Late cancer recurrence	6
Second primary malignancy	7
Cardiopulmonary disease	4
Unrelated to cancer and treatment	7

well Park tumor registry was used to determine ultimate causes of death in long-term postpneumonectomy survivors.

RESULTS

Over a 25-year period between 1964 and 1989, 246 patients with nonsmall cell lung cancer underwent pneumonectomy at Roswell Park Cancer Institute. Forty-nine long-term survivors (5 or more years) form the basis of this review. In this group of long-term survivors, follow-up ranged from 60 to 240 months, with a mean follow-up of 113 months. Squamous cell carcinoma was present in 36 patients (73%) and adenocarcinoma was present in 8 (16%).

Twenty-five (51%) of the long-term survivors were alive at the time of this study. Twenty-four (49%) had died. Of 24 patients who died 5 or more years after pneumonectomy, 6 died of late recurrence of lung cancer, 7 died of second primary malignancies, 4 died of cardiopulmonary disease, and 7 died of causes unrelated to cancer and its treatment (Table I). In the group of 7 patients who died of second primary malignancies, 1 had a second primary lung cancer and 6 patients died of nonpulmonary malignancies (tongue—2, prostate—1, colon—1, cervix—1, leukemia—1). Of the 4 patients who died of cardiopulmonary disease, 3 deaths were from respiratory insufficiency and 1 patient died of congestive heart failure. In these 4 patients, the prior pneumonectomy was thought to be a contributing factor to pulmonary and cardiac deterioration.

DISCUSSION

In this retrospective review, 20% of patients undergoing pneumonectomy for nonsmall cell lung cancer survived 5 or more years. Long-term survivors after pneumonectomy for nonsmall cell lung cancer may succumb to late cancer recurrence, second primary cancers, and cardiopulmonary dysfunction related to pulmonary resection. In this study, 12% of 5-year survivors died of late lung cancer recurrence. This figure is higher than that reported from other institutions [3]. Most lung cancer recurrences occur in the first 5 years after treatment; <10% of recurrences develop 5 or more years after surgical treatment [1,3].

Patients cured of nonsmall cell lung cancer remain at

risk for developing second primary lung cancers. The risk is ~10% in long-term survivors [3,4]. Many of these second primary lung cancers prove to be fatal. We were surprised to find only one death from second primary lung cancer in 49 long-term survivors after pneumonectomy. The difference between our findings and the data reported in the medical literature can be partly, but not completely, explained by the restriction of this study to postpneumonectomy patients. Presumably, the risk of second primary lung cancers is lower in pneumonectomy patients than in patients with lesser resections, because there is less lung tissue at risk for malignancy.

Patients cured of nonsmall cell lung cancer are also at risk for developing second primary tumors in other organ systems. In this review, 12% of 5-year pneumonectomy survivors died of nonpulmonary second primary malignancies. Other investigators have reported slightly lower mortality rates from nonpulmonary malignancies in lung cancer patients [2,3]. Although some of these malignancies in other organ systems are undoubtedly coincidental, we would expect lung cancer survivors to have a higher risk of malignancy than the general population. Environmental factors that play an etiological role in lung cancer, such as cigarette smoking, also contribute to the genesis of other cancers. Similarly, oncogene and tumor suppressor gene abnormalities play a role in the genesis of many malignancies, including lung cancer.

Pneumonectomy is associated with greater operative morbidity and mortality than lobectomy [5]. Patients treated by pneumonectomy also have a poorer long-term survival than patients treated by lobectomy [1]. This poorer long-term survival is largely related to adverse tumor factors that are more prevalent in pneumonectomy than lobectomy patients. Nevertheless, pneumonectomy results in greater long-term cardiopulmonary disability than lobectomy, and this can contribute to late death from cardiopulmonary causes [3]. Pneumonectomy limits pulmonary reserve and results in increased pulmonary artery pressures. Late respiratory insufficiency and cor pulmonale can occur. We encountered late cardiopulmonary death in 8% of our long-term pneumonectomy survivors. The previous pneumonectomy was considered to be a predisposing, but not exclusively causative, factor for cardiopulmonary death in these patients. Compared with other studies, our incidence of late cardiopulmonary death was low. Shields found cardiopulmonary diseases to be the major cause of death in long-term survivors of lung cancer resections [3]. However, most of those patients were treated by lobectomy, and the relationship between the previous pulmonary resection and late cardiopulmonary death was not well defined. If our data are considered with that reported in the medical literature, it is apparent that late cardiopulmonary death secondary to adverse physiological effects of pneumonectomy is an uncommon problem.

CONCLUSIONS

Our results show that long-term survival after pneumonectomy for nonsmall cell lung cancer is possible in ~20% of patients. Late lung cancer recurrence and second primary malignancies are important causes of death in these patients. Late cardiopulmonary insufficiency related to adverse physiological consequences of pneumonectomy is uncommon. We agree with others that careful long-term follow up is needed after pneumonectomy for lung cancer [3,4]. The purpose of follow-up is to detect late recurrences of lung cancer, second primary malignancies, and late deterioration in cardiopulmonary function. Although follow-up may be useful for these reasons, data proving the cost effectiveness of this approach are currently lacking [6].

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